

## CLAIMS

1. A computer based method (100) for obtaining a musculo-skeletal model (240) of at least part of a body of a creature from a series of time-dependent optical 3 dimensional images of the surface of said at least part  
5 of a body of a creature, the method comprising
  - detecting (104) anatomical surface information (220) based on a topography of the surface in said series of time dependent optical 3 dimensional image of the surface of said at least part of a body of a  
10 creature, and
  - reconstructing (106) internal structures (230) based on said detected anatomical surface information (220).
2. A method (100) according to the previous claim, wherein said series of time-dependent optical 3 dimensional images of the surface of said at least  
15 part of a body of a creature is provided using structured light projection.
3. A method (100) according to any of the previous claims, wherein said series of time-dependent optical 3 dimensional images of the surface of said at least part of a body of a creature is provided using raster line (170) triangulation.
- 20 4. A method (100) according to any of the previous claims, wherein said series of time-dependent optical 3 dimensional images of the surface of said at least part of a body of a creature is provided using stereoscopic techniques.
5. A method (100) according to any of the previous claims, wherein said  
25 series of time-dependent optical 3 dimensional images of the surface of at least part of said body of a creature is provided by obtaining said 3 dimensional images whereby each of a width, height and depth of said 3 dimensional images can have a length up to 1,2 m.
6. A method (100) according to any of the previous claims, wherein said  
30 time-dependent 3 dimensional image of the surface of said at least part of the body of a creature is provided using a multi-view system.

7. A method (100) according to any of the previous claims, wherein said detecting (104) anatomical surface information (220) based on a topography of the surface in said series of time-dependent optical 3 dimensional images is obtained by active contour modelling.
- 5 8. A method (100) according to claim 7, wherein said active contour modelling is based on optimising a finite number of active contour points, whereby all active contour points substantially being at an equal distance.
9. A method (100) according to any of the previous claims, wherein said detecting (104) anatomical surface information (220) based on the  
10 topography of the surface in said series of time-dependent optical 3 dimensional image is obtained by active shape modelling.
10. A method (100) according to any of the previous claims, wherein said reconstructing (106) internal structures (230) comprises at least one of the group of bones, ligaments, tendons and muscles.
- 15 11. A method (100) according to any of the previous claims, wherein said anatomical surface information (220) are landmarks.
12. A method for collecting data suitable for diagnostics of disorders in creatures, comprising building a computer based musculo-skeletal model (240) obtained according to a method (100) of any of the previous claims.
- 20 13. A system for obtaining a musculo-skeletal model (240) of at least part of a creature, the system comprising
  - means for providing a series of time-dependent optical 3 dimensional images of a surface of said at least part of a body of a creature,
  - means for detecting anatomical surface information (220) on said series  
25 of time dependent optical 3 dimensional images of a surface of said at least part of a body of a creature, and
  - means for reconstructing internal structures (230) based on said detected anatomical surface information (220).
- 30 14. A system according to claim 13, wherein said means for providing a series of time-dependent optical 3 dimensional images of a surface of said at least part of a body of a creature comprises a means for obtaining optical 3 dimensional images of the surface of said at least part of a body of a creature.

15. A system according to any of claims 13 to 14, wherein said anatomical surface information (220) are landmarks.
16. A computer based method for detecting and/or extracting from a series of time-dependent images of a surface of body parts of a creature anatomical features on surface measurements, said method comprising using invariant feature analysis to determine anatomical landmarks and shapes, wherein said invariant feature analysis comprises fulfilling predetermined conditions describing topographic characteristics of the surface of the body parts of the creature and fulfilling predetermined conditions describing topographic, topologic and/or volumetric characteristics of the interior of the body parts of the creature.
17. A computer based method according to claim 16, wherein said topographic characteristics of the surface of the body parts of the creature are at least one of curvature and symmetry of surface parts of the body parts of the creature and wherein said topographic, topologic and/or volumetric characteristics of the interior of the body parts of a creature are at least one of the relative position, bending, torsion, equidistance and dynamical properties of interior parts of the body parts of the creature.
18. A method according to claim 17, wherein said topographic characteristics of the surface of the body parts of the creature are curvature and symmetry of surface parts of the body parts of the creature and said topographic, topologic and/or volumetric characteristics of the interior of the body parts of a creature are the relative position, bending, torsion, equidistance and dynamical properties of interior parts of the body parts of the creature.
19. A method according to any of claims 16 to 18 wherein said predetermined conditions describing topographic characteristics of the surface of the body parts of the creature and said predetermined conditions describing topographic, topologic and volumetric characteristics of the interior of the body parts of the creature are determined by biomechanical constraints.

20. A computer based method for constructing a biomechanical model of a musculo-skeletal structure of at least part of a body of a creature from time-dependent anatomical surface information, said method comprising
- determining from said time-dependent anatomical surface information a set of boundary conditions for a biomechanical model of a musculo-skeletal structure, and
  - fitting a bio-mechanical model of a musculo-skeletal structure according to said set of boundary conditions.
21. A computer based method according to claim 20, wherein said anatomical surface information comprises both landmarks and surface shapes.
22. A computer based method according to any of claims 20 or 21, wherein said method furthermore comprises initially scaling and calibrating said bio-mechanical model of a musculo-skeletal structure based on anatomical surface information obtained for said at least part of a body of a creature in a predefined position.
23. A computer based method according to any of claims 20 to 22, wherein said method furthermore comprises, after fitting a biomechanical model of a musculo-skeletal structure, checking the plausibility of said biomechanical model of a musculo-skeletal structure with respect to biomechanical constraints.
24. A computer based method according to any of claims 20 to 23, wherein said method furthermore comprises, after fitting a biomechanical model of a musculo-skeletal structure according to said set of boundary conditions, dynamically adjusting and refining said biomechanical model of a musculo-skeletal structure from repeatedly obtained new time-dependent anatomical surface information, by repeatedly
- determining the new boundary conditions for a biomechanical model of a musculo-skeletal structure based on said new time-dependent anatomical surface shape information, and
  - adjusting said biomechanical model of a musculo-skeletal structure according to said set of new boundary conditions.

25. A computer based method of extended modelling of kinematics, kinetics and dynamics of the musculo-skeletal system of a moving body comprising extraction of relevant parameters from the bio-mechanical model according to any of claims 20 to 24.
- 5 26. A computer program product for executing the method as claimed in any of claims 1 to 12 or 16 to 25.
27. A machine readable data storage device storing the computer product of claim 26.
28. Transmission of the computer program product of claim 27 over a local  
10 or wide area telecommunications network.